PRACTICES AND TECHNOLOGIES DESIGNED TO PROTECT BIRDS

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INTRODUCTION

More than 20 years have passed since the first production well began pumping oil in Prudhoe Bay. Over the intervening years, our understanding of the impacts of oil development on birds and the mitigation practices to avoid and minimize those impacts have progressed substantially. In this brief description of the practices used to protect birds, I first review the development issues that potentially effect the bird communities in oilfields on the Arctic Coastal Plain, then the species of birds that receive most attention, and finally research and monitoring methods that guide effective mitigation.

DEVELOPMENT ISSUES

The issues on the Arctic Coastal Plain are general and probably are germane to development elsewhere, but I am going to address specific issues on the coastal plain, which is a breeding area for a diverse assemblage of long-distant migrants and a few resident species. For a full discussion of development impacts and mitigation measures at a recently developed oilfield, I refer readers to the Alpine Project Environmental Evaluation Document (ARCO 1997). The following list of issues pertain to most oilfield developments:

1. habitat loss or modification, either long- or short-term, usually results from placement of gravel pads and roads, airstrips, pipelines and powerlines, and other infrastructure;

2. disturbance from noise, vehicles, aircraft, predators, or people may change habitat use, affect behavior, decrease nest attendance, increase risk of predation, and increase energetic costs. People and predators usually elicit the greatest disturbance responses from birds;

3. death and injury from bird collisions with vehicles and structures such as powerlines claim an unknown number of birds. A growing concern is the potential for collisions of migrating flocks of birds, particularly eiders, that fly along the coast. In fog or conditions of reduced visibility, birds sometimes collide with buildings, towers, and powerlines. Such collisions are infrequent but can kill large numbers of birds in single incidents;

4. predation is a major factor limiting the productivity of ground nesting birds on the coastal plain. Arctic and red foxes, brown bears, Glaucous Gulls, Common Ravens, and several spp. of jaegers are endemic to the coastal plain and prey on birds and their eggs. Nesting colonies of brant on the Colville Delta of over 1,000 nests have suffered near complete failure from a single bear and similar failures have occurred from bears and arctic foxes at Howe Island, a brant and snow goose colony on the

Sagavanirktok River Delta. Foxes, bears, gulls, and ravens are attracted to human food sources, which are available when waste management is ineffective;

5. hydrocarbons and byproducts of oil production potentially can contaminate birds and cause death, injury, decreased productivity, or reduced health; and

6. marine oilspills can be devastating to bird life depending on the location, timing, volume, and containment of a spill. Marine spills are a major concern for offshore oil development.

Not all species of birds that occur on the coastal plain receive the same attention when it comes to oilfield development. Two species are federally listed threatened species—Steller's Eiders and Spectacled Eiders—that require special clearance before new facilities can be constructed. There are several species that are rare locally (i.e., do not breed in all the available habitat): Yellow-billed Loons, Bar-tailed Godwits, and Peregrine Falcons. Species that are known or suspected to have declining populations, either regionally or globally, are granted more protection than other species, and this list changes as our knowledge improves: Brant, King Eiders, Oldsquaws, Red-throated Loons, and Buff-breasted Sandpipers. Finally, there are species that are protected because they have special subsistence or economic values: Tundra Swans, Greater White-fronted Geese, and Snow Geese.

PRACTICES

The specific practices and technologies employed for bird research and protection are somewhat dependent on the stage of oil development. The most effective protection for birds and wildlife in general is to incorporate baseline information on distribution, abundance, and habitat use into the design and location of oilfield facilities. A recent example of this strategy is the Alpine development project, which used seven years of baseline studies on the Colville River Delta (Smith et al. 1993, 1994; Johnson 1995, Johnson et al. 1996, 1997, 1998, 1999a) as technical data to identify preferred habitats and specific nest and brood-rearing sites for the species of concern in the area. Using GIS and habitat modeling techniques (see Murphy 2000, in this proceeding; Johnson et al. 1999a), baseline data on site specific use were analyzed to map habitat preferences for individual species and the species data were then integrated into maps of species diversity for different sets of species (e.g., rare species, subsistence species) (ARCO 1997). Through this process specific areas and habitats are identified that may be considered more sensitive to oilfield development. Pads and roads locations can be modified then to avoid or minimize their incursion into valuable bird habitats and specific use areas. Baseline data on the regional distribution, abundance, and habitat use for large showy species are usually collected during surveys from aircraft timed for important periods in the breeding cycle of birds. Site specific surveys are conducted in the proposed location of the oilfield and support facilities for nests and broods of species that are difficult to see from the air are conducted with intensive ground-based searches (Johnson et al. 1999a, 1999b).

Although the above techniques are employed prior to development in the planning stages, they also may be employed, along with other techniques, during the construction and operational stages of oilfield development to identify responses of birds. A brief and incomplete description of some of these other techniques follows. Radio and satellite telemetry are used to follow movements of individual birds within oilfields (to identify

nesting and brood-rearing areas as well as bird movements relative to facilities) and beyond (to identify molting, staging, and wintering areas) (TERA 1996). Capture and banding of Brant and Snow Geese are conducted to identify migration routes, staging and wintering areas, and estimate survival rates (Anderson et al. 1999). Radar is used to identify flight paths and flight elevations of migrating birds in places where structures could lead to collisions (Day et al. 1998). Time-lapse photographs or videotapes are used to monitor the effects of disturbance and predation at nest sites (Anderson et al. 1999, Johnson et al. 1999b). Temperature sensors implanted in artificial eggs are used to monitor nesting behavior as part of disturbance studies in oilfields (Anderson et al. 1999, Johnson et al. 1999b). All these techniques are most effective at measuring oilfield impacts when they are conducted before and after construction in both affected and reference sites (Stewart-Oaten et al. 1986), but a number of techniques can be effectively used in paired plot and blocked designs or in gradient analyses after construction or operation has begun (Murphy and Anderson 1993, TERA 1993, Ellis and Schneider 1997). Studies of bird responses to development have provided invaluable information that can be applied to minimize potential impacts in oilfields.

Another effective practice to protect nesting birds is the reduction of disturbance and predation. Seasonal restrictions on aircraft, vehicles, noise, and people on foot in nesting and brood-rearing areas help maintain avian productivity. Winter construction, particularly of roads, pads, and pipes, eliminates much of the disturbance related to heavy equipment. Maintaining minimum flight altitudes is an effective measure to reduce aircraft disturbance. The level of predation can be controlled with effective waste and food management. Eliminating the availability of human food to predators reduces the attraction of predators to oilfields and thus reduces the level of predation on birds and their nests.

Research is an essential element in the array of practices used to protect and maintain the bird community in the vicinity of oilfields. Continued research and monitoring into habitat selection, the effects of disturbance, and new approaches to mitigation are needed to improve our ability to protect birds and to search for cost-effective management practices. More species are likely to come under concern as global and regional modifications in habitat and climate cause populations to decline. Regardless of where problems occur in a species range, protection of species with declining populations will be a necessity on their breeding grounds.

Conclusions

The most effective protection of avian communities during oil and gas development is through the design and siting of projects. Baseline data on species abundance and distribution can be integrated into a habitat evaluation through GIS that can take into account multiple rare, sensitive, or socially valued resources. These tools make it possible for development to avoid specific nest sites as well as habitat that has a high potential for use.

Another important protection is an effective mitigation program to minimize the attraction of predators and the impacts of disturbance. Controlling the availability of human food to foxes, bears, gulls, and ravens is essential to maintaining a healthy productive community of breeding birds in a developed area. Minimizing disturbance through managing aircraft, vehicle, and pedestrian traffic during the nesting season and during

the brood-rearing season in specific habitats allows the birds opportunities to produce young without additional stress.

Research and monitoring into habitat selection, the effects of disturbance, and effective approaches to mitigation continue to be needed to supply information for bird management and protection. More species are likely to decline from global or regional modifications in populations and habitat, and these species will need protection on their breeding grounds.

Finally, the cost of proactive strategies—collecting baseline data, effective design and siting of projects, effective mitigation programs, and continued research—might seem expensive. But it may be cost effective when we consider the costs of increased oversight and regulation by resource agencies, lawsuits and injunctions, missed construction seasons and deadlines, and delayed production. The Alpine oilfield and Tarn development in Kuparuk are examples of new development where this strategy has worked.

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